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BACKGROUND INFORMATION SEARCH ON CERRO COPPER PRODUCTS CO. AND THE IEPA SAUGET/DEAD CREEK PROJECT

FOR

CERRO COPPER PRODUCTS CO.

SAUGET, ILLINOIS

BY

SVERDRUP CORPORATION

ST. LOUIS, MISSOURI

December 4, 1987

C00283

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CORPORATION

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TO: Cerro Copper Products Company DATE: December 4, 1987

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East St. Louis, Illinois 62202 ATTN: Mr. Sandy Silverstein

JOB NO. 10422 PROJECT: Background Information Search

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Should you have any questions please feel free to call.

Sverdrup Corporation

BY Steven M. Hornung
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I INTRODUCTION

Cerro Copper Products Company and their predecessors, Cerro DePaseo Co and Lewin-Mathes Company have operated a secondary copper smelting operation in Sauget, Illinois since the late 1920s. A portion of the property currently owned by Cerro has been included in a hazardous waste Remedial Investigation/Feasibility Study (RI/FS) conducted by Ecology & Environment, Inc. (E&E) on behalf of the Illinois Environmental Protection Agency (IEPA).

The RI/FS involves twelve (12) individual sites in the Sauget area and six (6) sections of Dead Creek. Cerro owns property that contains one complete site (Site I), one section of Dead Creek (Site A), and a portion of a second site (Site G). The Site Plan in Appendix I illustrates the areas currently being investigated by the IEPA.

A background information search was conducted by Sverdrup Corporation to compile information relating to property ownership, past property usage, site geology, hydrogeology, and previous investigations and events which developed into the current studies being conducted on Cerro property. Because the sites are in close proximity to each other, research was also conducted on the other sites to gather data that may relate disposal activities and contaminants at the various sites. It was also desired to investigate if Cerro could possibly be viewed as a Potentially Responsible Party (PRP) for any of the other sites.

II SITE DESCRIPTION

A. TOPOGRAPHY

The Cerro Copper Products Plant is situated within the Mississippi River floodplain known locally as the American Bottom. The floodplain is bounded to the west by the Mississippi River and to the east by uplands that generally form a sharp bluff ranging from 100 to 250 feet in height. The floodplain ranges in width from over 10 miles near Granite City to 5 miles in Sauget, and constricts to less than 3 miles at Dupo to the south.

The topography of the American Bottom is typical of a floodplain and contains ridges and swales, low broad swamps, terraces, meander scars and oxbow lakes formed by the shifting Mississippi River. The land surface is relatively flat; the local relief ranges from EL. 400 near the river to EL. 445 along terraces bordering the upland bluffs to the east. The approximate surface elevation at the site is EL. 405. The meandering of the Mississippi River channel east and west across the floodplain has resulted in generally north - south trending ridges and swales, and heterogeneous interbedding of sands, silts, and clays within the surficial floodplain deposits.

B. SURFACE DRAINAGE

Surface drainage is relatively undeveloped, as evidenced by broad swamps found in the floodplain. Drainage is normally towards the Mississippi River and its tributaries: Wood River, Cahokia Diversion Channel, Cahokia Canal and Prairie Dupont Floodway (Figure 1). These tributaries drain much of the floodplain and bordering uplands. Most of the American Bottom is protected from flooding by a system of levees that front the Mississippi River and flank its main tributaries.

Dead Creek is situated between the Cahokia Canal and Prairie DuPont Floodway, and drains the floodplain in the area of Sauget and Cahokia. It originates near the Cerro Copper Products Plant in Sauget, flows southwest through Cahokia and enters the Prairie DuPont Floodway, a total distance of 3 to 4 miles. The thickness and permability of the Cahokia Alluvium varies greatly between the ridges and swales, terraces

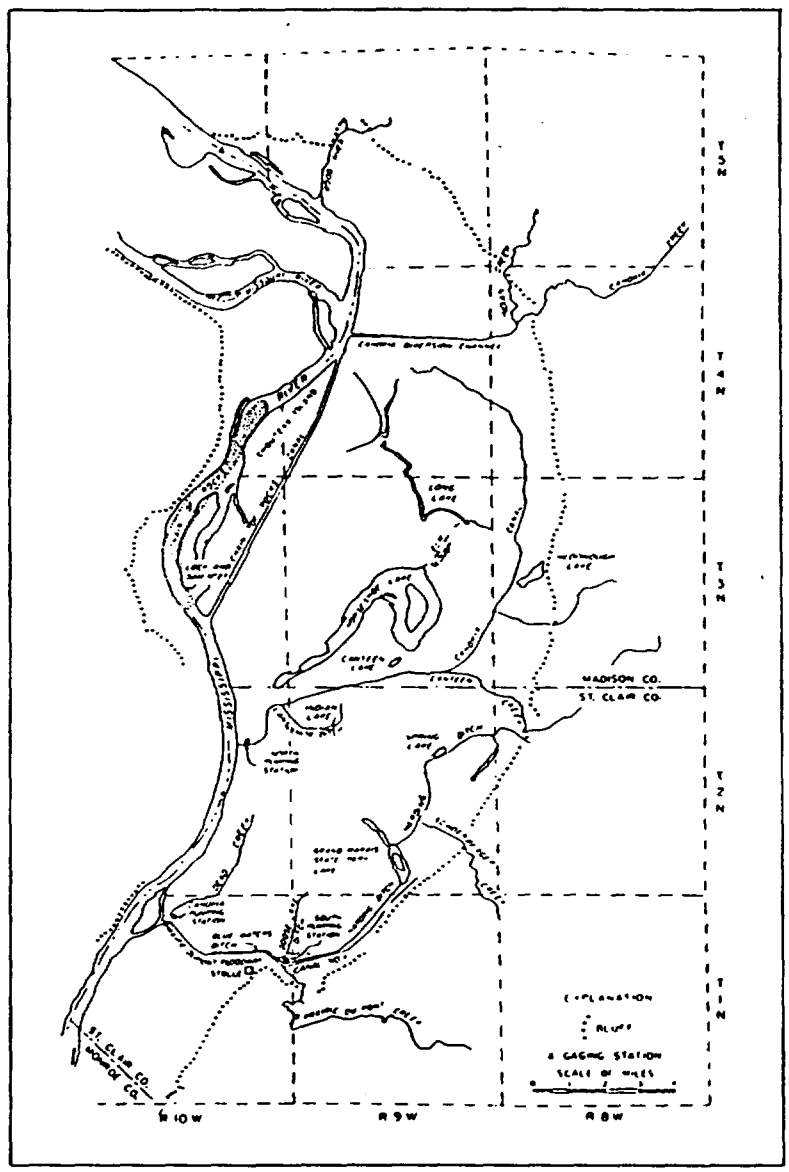

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Figure 1. Drainage System of the American Bottom

and swamps across the American Bottom. Its thickness can vary from 0 to 25 ft.

C. GEOLOGY

The site is located in the Mississippi River Floodplain on alluvial deposits approximately 120 ft in thickness. These deposits are classified into two formations: the Cahokia Alluvium, a thin surficial mantle of unconsolidated, poorly sorted silt containing sand and clay lenses; and the Henry Formation, a thick layer of glacial outwash consisting primarily of well sorted, arkosic, gray fine to medium sand with little gravel (Figure 2). The Henry Formation accounts for most of the valley fill thickness and is the major aquifer for the East St. Louis area. The Henry Formation becomes more coarse and permeable with depth.

Mississippian-age limestone is encountered at approximately 120 ft depth below the valley fill deposits at the site. The bedrock topography has a relief of about 40 ft across the American Bottom and its width varies from 0.5 to 1.5 miles trending in a north - northeast direction, similar to the Mississippi River today.

The bedrock generally consists of cyclic deposits of limestone, sandstone and shale, with a predominance of limestone. In the upland areas to the east of the site, Pennsylvanian-age bedrock has resisted erosion by the meandering Mississippi River and outcrops at the surface. These uplands contain a thin cap of Pennsylvanian sandstones, siltstones and shales overlying easily-solutioned Mississippian limestone that contain many karstic features. The bedrock structure is locally controlled by a north-northwest-trending fold known as the Waterloo anticline. The bedrock dips gently to the east-northeast away from the anticline.

Local subsurface conditions near the site were detailed in a 1981 IEPA report titled, "A Preliminary Hydrogeologic Investigation in the Northern Portion of Dead Creek and Vicinity," by Ron St. John. The field work generally confirmed the typical geologic conditions as previously described.

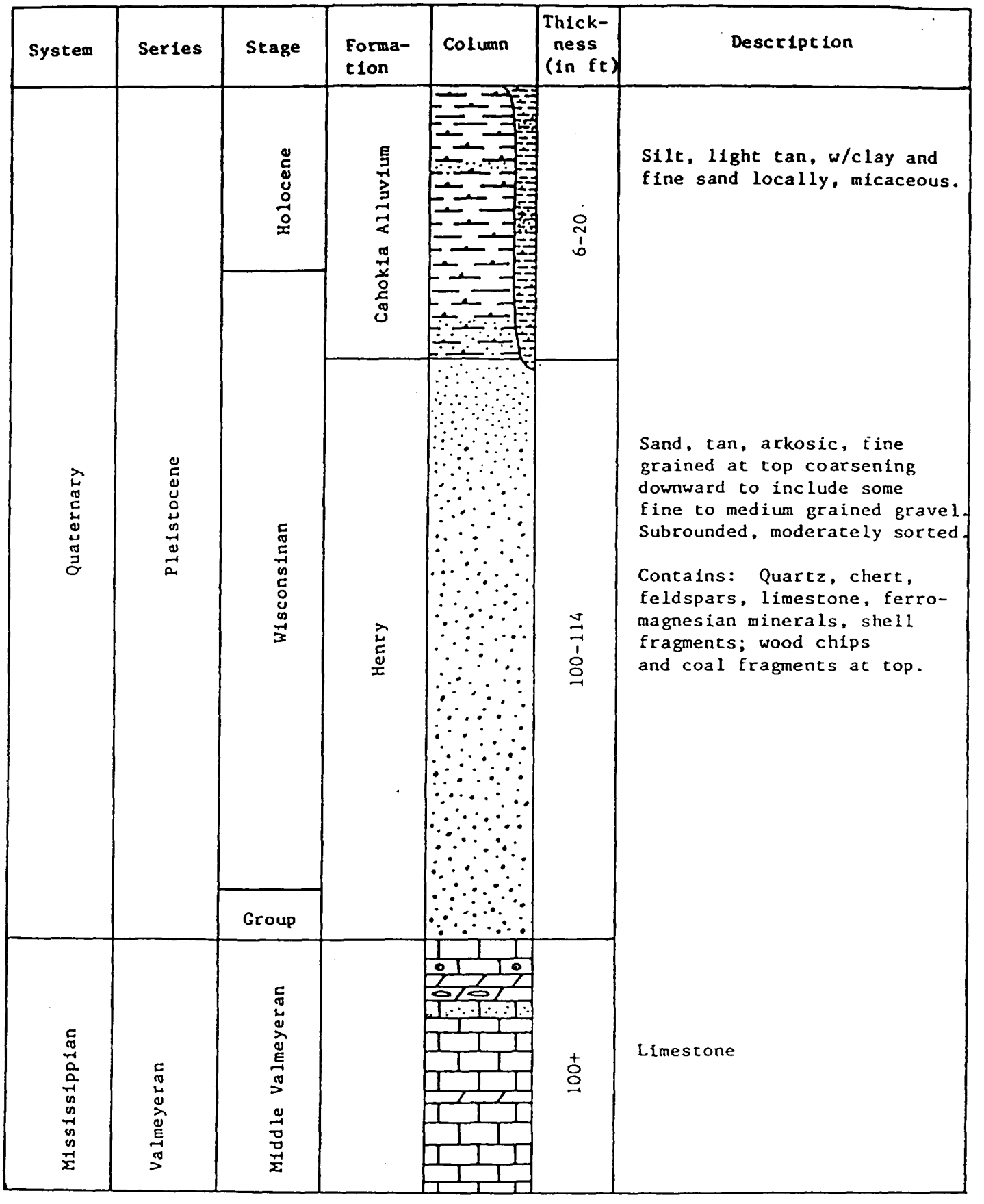

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Figure 2. Generalized Geologic Column for unconsolidated deposits to bedrock in the Dead Creek area.

The study found that the Cahokia Alluvium varied in thickness from 6 to 17 ft across the site and became thinner toward the east. The alluvium generally consisted of light brown to tan silt, with occasional gray clay and sand lenses, and became sandy near its base. Laboratory permeability values were measured on the order of $7x10^{-6}$ cm/sec in this layer.

The Henry Formation was found to be gray sand, fine - to coarse-grained, loose to medium dense, to a maximum boring depth of 35 ft. The sand was generally very fine - to fine-grained and uniform above 25 ft depth. An average laboratory permeability value of $4x10^{-3}$ cm/sec was obtained from two tests performed on representative sand samples.

Hand auger borings within the bed of Dead Creek found a relatively thick deposit of soft clayey silt to silty clay. This layer extended from 7 to 9 ft below the creek bottom, or to a depth of 15 to 16 ft below the ground surface. This deposit generally extended through the surficial Cahokia Alluvium and into the Henry Formation. The permeability of this creek bottom deposit may be on the order of $1x10^{-6}$ cm/sec.

The water table, or phreatic surface, was found within the Henry Formation at a depth ranging from 13 to 18 ft below the surface. These measurements were made during a time of drought. The water table depth can be expected to rise 3 ft or more after sufficient recharge from precipitation occurs. The Henry Formation, can, therefore, exhibit either a water table or a leaky artesian boundary condition, or both, depending on the thickness and permeability of the surface silt mantle, and the general elevation of the phreatic surface during a particular season.

D. HYDROGEOLOGY

Large quantities of potable groundwater are obtained from the clean sands of the major regional aquifer, the Henry Formation. Individual well yields commonly exceed 500 to 1,000 gallons per minute (gpm). With depth, the aquifer sands become more coarse with fine gravel, and the aquifer permeability increases from 10^{-3} to over 10^{-1} cm/sec (100 to over 2,000 gpd/sq ft). Aquifer transmissivity ranges from 50,000 to

over 300,000 gpd/ft across the American Bottom. Local transmissivities may exceed 300,000 gpd/ft (Schicht, 1964). A pump test performed by Mosanto Co. in 1952 determined a transmissivity of 210,000 gpd/ft, a storativity in the water table range at 0.082, and a permeability of 2,800 gpd/sq ft (0.13 cm/sec), typical for a clean sand and gravel aquifer.

The water-bearing Mississippian-age limestone and sandstone bedrock layers can provide small to medium groundwater supplies (10 to 50 gpm) where these layers are recharged from the unconsolidated Henry Formation aquifer above. However, because more accessible groundwater supplies of better water quality can generally be obtained from the Henry Formation sands, bedrock aquifers are not currently being exploited in the area.

Groundwater in the Henry Formation aquifer occurs under both leaky artesian and water table conditions. In other words, the phreatic (water table) surface can be found within the semi-confining Cahokia Alluvium silts or within the Henry Formation sands across the region. Large groundwater pumpage is responsible for reducing piezometric levels in many areas below the Cahokia Alluvium and forming water table conditions within the aquifer. Other factors affecting piezometric levels include the elevation of the Mississippi River and local precipitation.

Piezometric elevations at the site are greatly influenced by local industrial groundwater users. In 1980, the phreatic surface averaged 14 ft in depth. However, in the 1950s local piezometric elevations were 30 to 40 ft lower because of industrial pumpage of 30 million gallons per day (mgpd). Local pumpage in 1980 had decreased to 16 mgpd, and has continued to decrease since then. Records prior to 1900 indicate that local piezometric levels could recover 7 ft depth or less if local groundwater pumpage ceased.

The regional groundwater flow gradient is approximately 3 ft in 1,000 ft to the west, but with apparent local fluctuations. Groundwater flow velocities may range from 50 to 150 ft/yr within the shallow, fine to medium sand section of the aquifer, but may increase to greater than 1,000 ft/yr within the deeper medium to coarse sand and gravel portion of the aquifer. Estimates of average aquifer parameters important to modeling the aquifer boundary conditions include precipita-

III EXISTING INFORMATION REVIEW AND HISTORY OF RESPONSE ACTIONS

Response actions in the Dead Creek area began in the early 1970's. Records indicate that in 1971, a yellow discharge in Dead Creek was brought to the attention of state and local officials. Waggoner Trucking Co. was suspected, however, evidence to support this conclusion was not available. A possible discharge from Cerro Copper or Monsanto was also investigated but additional studies indicated the culvert under Queeny Avenue was blocked and the grade of the stream bed caused water on the north side of Queeny to flow to the north to a catch basin.

Later in 1971, tanker trucks labeled corrosive were observed discharging contents to the creek. Waggoner responded that the discharge to Dead Creek would be stopped and future disposal would be in a quarry pit. No further action from the state agency occurred until 1973 when additional discharge by Waggoner was observed. Response from Mr. Waggoner was that tanker truck washwater was being discharged into a circular hole approximately 100 yards behind their office. No additional actions by the state are recorded.

In 1975, another complaint was investigated concerning Cerro Copper discharging to Dead Creek. A hydraulic link between Dead Creek and the blocked channel on Cerro's property was not determined and further work was not conducted. The source of the discoloration in the creek was not determined.

In 1980, the site began attracting greater attention with reports of smoldering materials in the creek and a report that a resident's dog had rolled in the creek and died of apparent chemical burns. Sediment samples were obtained by the IEPA and analysis revealed high levels of heavy metals, phosphorous and PCBs. A snow fence was installed by the Illinois Department of Transportation around the section of creek between Queeny Avenue and Judith Lane in an effort to limit access. In 1982, this was upgraded with a chain-link fence.

A preliminary hydrogeologic investigation was conducted of the area in 1980 and 1981 to determine locations of possible disposal, and impacts on the groundwater, soils and plants in the area. Results of this study are reported in "A Preliminary Hydrogeologic Investigation in

the Northern Portion of Dead Creek and Vicinity" written by Ron St. John. The investigation documented extensive contamination of soil, surface water, and groundwater. Being preliminary in scope, the investigation posed more questions than it answered, noting that the presence of hazardous substances in the area is likely to be widespread.

In the fall of 1984, the IEPA bid a limited clean-up project to remediate a portion of Dead Creek and the area south of Queeny Avenue and west of the creek. The Agency reconsidered this project in December of 1984 and it was decided that the Sauget area including Dead Creek required a thorough investigation prior to clean-up. It was determined that a full-scale Remedial Investigation/Feasibility Study (RI/FS) was needed.

The Dead Creek project, renamed the Sauget Sites project, was expanded in the spring of 1985 to include 18 potential hazardous waste dump sites, which included six sections of Dead Creek. In November of 1985, Ecology and Environment, Inc. (E&E), the IEPA selected contractor, began the detailed study.

In June of 1986, IEPA requested E&E to submit a proposal to revise the scope of work for the RI/FS. The revisions concentrated on developing the necessary data base to place the sites on the National Priorities List (NPL) or the State Remedial Action Priority List (SRAPL). Placement on the NPL and/or SRAPL would allow Superfund and Illinois Hazardous Waste Fund monies to be made available for the necessary remedial activities. The proposal was accepted and field work conducted in 1987 was structured to develop this data base. In June 1987, IEPA suggested to E&E the idea of dropping the Feasibility Study completely. This would allow the use of the additional contracted funds to be used for the RI phase. It is believed that this idea was finalized in July 1987 and the additional money will be used for the Hazardous Ranking System (HRS) package and the RI.

The following is a description of each site and the work conducted to date:

SITE A

Site A is the northern portion of Dead Creek between the Monsanto Krummrich Plant and Queeny Avenue. It is located on property currently owned by Cerro Copper Products.

Prior to 1970, regulatory officials believe the creek received discharge from Monsanto, Cerro Copper and other industries in the area. Currently, this section of the creek is not a contiguous portion of Dead Creek as the culvert under Queeny Avenue was sealed off in the early 1970's. The creek bed was regraded to the north and all drainage flows to a concrete catch basin and directed to an interceptor sewer on Monsanto property. Flow ultimately drains to the Sauget Wastewater Treatment Plant.

Samples of the surface water and sediment in Site A were obtained during the Preliminary Hydrogeologic Investigation conducted by the IEPA in 1980 and 1981 and the results are reported in the "St. John Report". The surface water from the creek showed elevated levels of cadmium, copper, lead, mercury, nickel, phosphorus, silver and zinc. PCBs were detected at trace levels and the total aliphatic hydrocarbons level for one of the samples was 23,000 ppb. The sediment samples also had elevated levels of the same parameters as well as detectable levels of dichlorobenzene (1.7 ppm).

Additional sediment and water samples were collected by E&E in November, 1986, as part of their RI study. Samples were split with Cerro representatives, however, the split samples were not analyzed. Draft results of E&E's testing indicate PCBs, Polynuclear aromatic hydrocarbons (PAHs), and chlorinated benzenes are present in the sediment. Low ppb level chlorinated organics and PAHs were also detected in the surface water. PCBs were not detected. Inorganic data on the samples is not available at this time.

One groundwater sample obtained during the preliminary study contained elevated levels of metals and trace levels of organics. The source of the contamination cannot be linked directly with the creek since the proximity of other potential sites will also influence the water quality found in this well. Additional monitoring wells installed by E&E adjacent to the creek are addressed in the write-up on Site I.

SITE B

Site B is the portion of Dead Creek between Queeny Avenue and Judith Lane. The banks of the creek are heavily vegetated and debris is scattered throughout the northern one-half. Culverts at Queeny Avenue and Judith Lane have been blocked to prevent any release of contaminants, however, the effectiveness of the seal has been questioned.

Concerns of contamination in Dead Creek began in the early 1970's with reports of dumping of hazardous truck washings by Waggoner Trucking Co. and complaints of Cerro Copper discharging contaminants into the creek. The reports of discharging by Cerro were citizen complaints of contamination (discoloration) downstream. The incidents were investigated but the discharge was not located. Evidence was not available that the sealed culvert under Queeny Avenue was leaking and water from Cerro's property was observed to flow north, to a Monsanto storm sewer. The source of the discoloration was not determined.

In August, 1980 a local resident's dog reportedly died from chemical burns resulting from contact with the materials in the creek. As a result of this incident, sediment samples were taken for chemical analysis. Results indicated high levels of PCBs (120 ppm) phosphorous (7,040 ppm), and lead (2,400 ppm). The IEPA soon after authorized fencing the area to limit access. A snow fence was installed around the creek section by the Illinois Department of Transportation in September of 1980. This was upgraded to a chain link fence in 1982.

The results from the preliminary hydrogeologic study conducted by the IEPA in 1980 indicated PCB concentrations in the ditch sediment as high as 10,000 ppm. Although not all of the sediment samples obtained were analyzed for other organic parameters, those that were did not show large amounts of contamination. Subsurface samples obtained from the creek indicated 9,200 ppm PCBs near the surface to 53 ppm at depths between 4 and 7 feet. Other organics which were found at concentrations in the hundreds and thousands of ppm at the 3 foot level included biphenyl, dichlorobenzene and trichlorobenzene.

In October of 1980, the IEPA and Monsanto cooperatively collected three additional sediment samples from Site B to confirm results of earlier sampling. PCBs (45-13,000 ppm) and chlorinated benzenes were found in all three samples and chlorinated phenols and phosphate esters were detected in two of the three samples.

In December, 1982, as part of an area-wide dioxin sampling effort managed by the USEPA, two more sediment samples were collected from Site B. Both samples were analyzed specifically for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). One sample was below detection limits and the other showed a quantified level (0.54 ppb) of TCDD. Although detectable, this level is generally not considered a health concern by regulatory agencies. No additional work, directly related to the dioxin samples is recorded.

Water samples from monitoring wells installed adjacent to the creek indicate inorganic contamination of the subsurface water. Copper (0.97 ppm), lead (0.32 ppm), phosphorus (10 ppm), and silver (0.02 ppm) were detected at levels above Illinois General Water Use Standards in one or more of the wells. Elevated levels of iron and mangenese were also detected but these are believed to be natural concentrations found in the area. The source of PCB contamination detected in groundwater samples cannot be directly linked to the creek as there are other possible sources in the immediate vicinity.

Additional samples were obtained by E&E in 1987 to further characterize the site. Draft results of this effort indicate the sediment contains elevated levels of PCBs, PAHs, and chlorinated benzenes. Surface water samples indicated little to no organic contamination except for detectable levels of PCBs in the low ppb range. Inorganic results are not available at this time.

SITES C THROUGH F

Sites C through F include the reaches of Dead Creek south of Judith Lane to its discharge into Old Prairie DuPont Creek. The creek sectors have been identified as follows: C-Judith Lane to Cahokia Street, D-Cahokia Street to Jerome Street, E-Jerome Street to the intersection of Route 3 (Mississippi Avenue) and State Route 157, F- the intersection of Route 3 and Route 157 to Old Prairie DuPont Creek.

There are no known discharges to the sections of Dead Creek south of Judith Lane except for surface runoff. The culvert under Judith Lane has been blocked to prevent flow from the upper reaches, however, the effectiveness of the seal has been questioned. Flow from the culvert has been reported on several occasions.

The IEPA collected five sediment and two surface water samples from the creek as part of their Preliminary Hydrogeologic Study performed in 1980 and 1981. The surface water samples were taken from sections C and E and indicated very little contamination. A level of 1 ppb of PCBs was detected in Section C and copper levels (0.26 and 0.04 ppm) were above general water use standards in both sectors but were below standards for discharge to waterways.

The sediment samples contained relatively high concentrations of heavy metals. The highest levels detected being: cadmium-50 ppm, chromium-400 ppm, copper-17,200 ppm, lead-1,300 ppm, nickel-2,300 ppm and zinc-21,000 ppm. The only organics detected in the sediments were PCBs, which were detected in all of the samples but the one taken from Section F. The highest level of PCBs detected was 2.8 ppm, found in a sample taken south of Jerome Street in Section E.

Draft results from additional sampling conducted by E&E in creek sections C and D indicate levels of PAHs, chlorinated benzenes and PCBs similar to those in Section B. Inorganic data on these samples is not available at this time. Sections E and F were not sampled during this phase. Surface water samples from the creek did not indicate detectable organic contamination.

SITE G

Site G is a parcel of land, approximately 4.5 acres, located south of Queeny Avenue; west of Dead Creek; east of Wiese Engineering company and north of a cultivated field. Aerial photographs indicate the site was utilized as a sand and gravel borrow pit prior to 1950 (see Appendix II). Following excavation, it is believed the site was used as a disposal area.

Currently, the site is littered with debris. Two small pits are located in the northeast section of the site. Oily and tar-like

wastes and rusted drums are also in these areas. Drums have also been found along the southern perimeter and along a mounded area at the western edge.

A large depression is found immediately south of the mounded area. A 1921 drawing originally developed by Darling & Company, and now owned by Cerro Copper, shows an uncultivated area labeled as an "oil overflow" in the same approximate location. In 1921 the western portion of the property that is now the Monsanto Krummrich Plant was owned or operated by Indiahoma Refining Company. The drawing indicates an oil sump or pond on the refinery property and it appears when the sump overflowed the release of oil eventually collected in the low area labled "oil overflow." The current existence of residual from the overflow is unknown; however, the potential exists that contamination is still present.

The northern portion of Site G, approximately 0.75 acres, is currently owned by Cerro Copper Products. The property was originally purchased by Lewin-Mathes Company (now Cerro Copper) in 1946 along with other portions of the plant property. This tract was ~~sold~~ to the Village of Monsanto (Village of Sauget) in 1948 and it ~~is believed to have~~ remained Village property until Cerro Copper re~~purchased~~d the land from the Village in 1969. The operator of the excavation and disposal activities during the late 1940s and 1950s is unknown.

Subsurface water samples, obtained in 1980 and 1981 by the IEPA during their preliminary study, indicated elevated levels of chlorophenol (1,200 ppb), dichlorophenol (890 ppb), chlorobenzene (63 ppb), dichlorobenzene (25 ppb), and PCBs (3.9 ppb) in one or more of the wells. Elevated levels of heavy metals including arsenic, barium, copper and lead, were also detected. Soil samples obtained during the boring of two of the monitoring wells were also analyzed and results indicate elevated levels of metals and PCBs. PCBs were detected down to a level of 13 feet. No other organic parameters were analyzed.

Three additional soil samples from Site G were obtained by the IEPA in 1984. These samples were obtained from and adjacent to one of the oily pits in the northeast corner of the site. Elevated levels of heavy metals were found in all of the samples as were various organic

contaminants. PCBs (18 ppm) were detected in the sample taken adjacent to the pit. The PCB concentration of the two pit samples were below detectable levels. The pit samples did contain various other organic contaminants, such as; aliphatic hydrocarbons (19,200 ppm), chlorobenzene (0.58 ppm), dimethyl phenanthrene (3,100 ppm) and trimethyl phenanthrene (1,400 ppm).

As part of the Dead Creek RI/FS project, E&E conducted a geophysical investigation of the site in December of 1985. The magnetometer survey showed a major magnetic anomaly over most of the northern portion of the site indicating the possibility of significant quantities of buried metals. An electromagnetics (EM) survey also showed intense anomalies over the northern portion. Negative anomalies were recorded in the center of the fill area possibly indicating large quantities of non-conductive material, such as concrete. The EM survey also showed anomalies leading off-site to the northwest, indicating the possibility that the original excavation extended under what is now Queeny Avenue.

In November of 1986, E&E conducted a surface sampling program at Site G. A grid was laid out at the site and samples were obtained from the top six inches of soil. Samples were screened utilizing an organic vapor analyzer (OVA) and selected samples were analyzed for volatile and semi-volatile priority pollutants, PCBs and pesticides. E&E's results indicate very high levels of organic contamination are present over much of the site. Levels of pentachlorophenol as high as 21,000 ppm and total PCBs as high as 19,100 ppm were detected. Octachlorodibenzo-dioxin levels were also tentatively identified in samples as high as 130 mg/kg.

It appears that only one of the samples obtained from the northern portion of property owned by Cerro Copper was analyzed. It is assumed this is because field screening did not indicate significant contamination. Results of the other samples do not indicate large amounts of volatiles, therefore, the screening may have missed contamination that is present. The one sample that was analyzed contained various PAHs, chlorinated benzenes, pentachlorophenol, and PCBs.

E&E notified the EPA of the high levels at Site G as soon as the results became available and recommended that the site be considered

an immediate threat or considered for a public health advisory. The IEPA notified the USEPA about the results and requested their assistance in securing the area. It should be noted that although the IEPA felt the site needed to be secured they did not want the method used to affect the HRS scoring for the National Priorities List (NPL). The disturbance or covering of the soil surface was not desired since this would affect air monitoring that was scheduled for the spring of 1987. The USEPA responded to the state request by recommending fencing and covering the exposed materials. The cover was to be delayed until after the air monitoring.

On April 24, 1987, the landowners and potentially responsible parties were asked to participate financially in the fencing operation. Monsanto notified the USEPA that they would take the lead and supply field crews and materials to install a fence around Site G. The fencing was completed in May of 1987.

The air monitoring was conducted by E&E at Site G on July 16 and 17, 1987. Results of this testing is currently unknown. To date, covering of the area has not taken place.

In January of 1987, E&E installed two additional monitoring wells on the portion of Site G owned by Cerro Copper. Samples were collected during the boring and a third bore hole was sampled also (see Figure 4). Samples were split with Cerro's representative and were analyzed for priority pollutants. A preliminary evaluation of the data indicates that the two borings G3 and G4 do contain detectable levels of organics but they are at much lower levels than that obtained from G5, which is located toward the middle of the section owned by Cerro Copper. Chlorinated benzenes, phenolics and PAHs were detected at levels above 100 ppm at boring G5. Draft data from IEPA also indicates this difference between the boring locations and the same relative concentrations.

Groundwater samples obtained from the two wells also indicated contamination of many of the same organic constituents as found in the soils.

SITE H

Site H is located southwest of the intersection of Queeny Avenue and Falling Springs Road. Aerial photographs suggest the site was initially utilized as a sand and gravel borrow pit and later used as a disposal area (see Appendix II). Currently the area is filled and vegetated with no visible signs of waste disposal.

Monsanto Company submitted a "Notification of Hazardous Waste Site" form to the U.S. EPA in 1981. The notification listed the site as the Sauget (Monsanto) Illinois Landfill and indicated the disposal of drummed organics had occurred until 1957. The Monsanto Company's Queeny Plant in St. Louis, Missouri also filed a similar notice. It is believed this may be the same disposal site as Site H since the notification indicated the location as Falling Springs Road.

As part of the Dead Creek Project, a geophysical survey, including flux-gate magnetometry and EM was conducted at Site H in December of 1985. Various anomalies were detected indicating the possibility of buried drums and contaminants. Confirmation of these preliminary findings has yet to be determined but additional borings and subsurface sampling have been completed. Draft results of additional work conducted by E&E indicate very high levels of chlorinated benzenes.

SITE I

Site I is property currently owned by Cerro that is bordered on the west by Dead Creek; the north by the Alton and Southern Railroad; the east by Falling Springs Road and the South by Queeny Avenue. The section of property owned by the Village of ~~Sauget~~ Sauget?, current location of City Hall is not included in the current investigation of Site I.

Aerial photographs suggest that portions of the site were utilized as sand and gravel pits from as early as 1937 to the mid-to-late 1950s (see Appendix II). When the borrow operations were discontinued the pits were filled in. It is believed waste materials from nearby industries were included with the fill. A portion of one of the borrow pits in Site I was contiguous with that in Site H. The construction of Queeny Avenue divided this pit into separate entities.

As indicated previously in the description of Section H, Monsanto Company submitted a "Notification of Hazardous Waste Site" form for disposal of drums containing organics in a landfill which may be these borrow pits. The possibility of drums and other chemical disposal is believed to be as likely for the Section I pits as for Section H.

A review of title information indicated that Cerro bought the southern portions of the property that contains the former pits in 1967 from Rogers Cartage Company. Rogers Cartage Company bought the property form Leo Sauget in 1965. Records indicate that Leo Sauget originally bought the property in three segments, at different times, 1931, 1943, and 1952. The last two segments were purchased from trust companies. The actual user of the property during the ownership of the trust company is not known. It appears from the aerial photos that the pit operations continued after the formal purchases by Leo Sauget. He also owned the southern most segment from 1931 to 1965, which encompasses the time period that the excavation and filling of a borrow pit occurred in that segment.

The northern tip of Section I was purchased in two pieces by Cerro in 1967 and 1968 from Lillie Mifflin and Harold Waggoner, respectively. There is no indication of chemical waste disposal in this area.

It is believed the midsection of Section I was purchased in 1955 from Leo Sauget. There is no indication of chemical waste disposal in this area either.

The IEPA Preliminary Hydrogeologic Investigation did not address Site I except to identify the past borrow pits. Soil samples were not taken from the area. As mentioned in the discussion of Site A, one monitoring well was installed on Cerro property theoretically downgradient of Site A and Site I. Analysis of the groundwater revealed elevated levels of copper, manganese, phosphorus, and zinc. Phenolics, chlorobenzene, dichlorobenzene, and chloroaniline were also detected in the water.

E&E performed a soil gas monitoring survey on Cerro property on November 19 and 20, 1986. The sampling locations are shown on Figure 3. Utilizing a slotted stainless steel point inserted into the ground, soil gas was screened using a Foxboro Organic Vapor Analyzer (OVA). Locations #9, 10, 11, 15, 16, and 19 had readings over 1,000 ppm

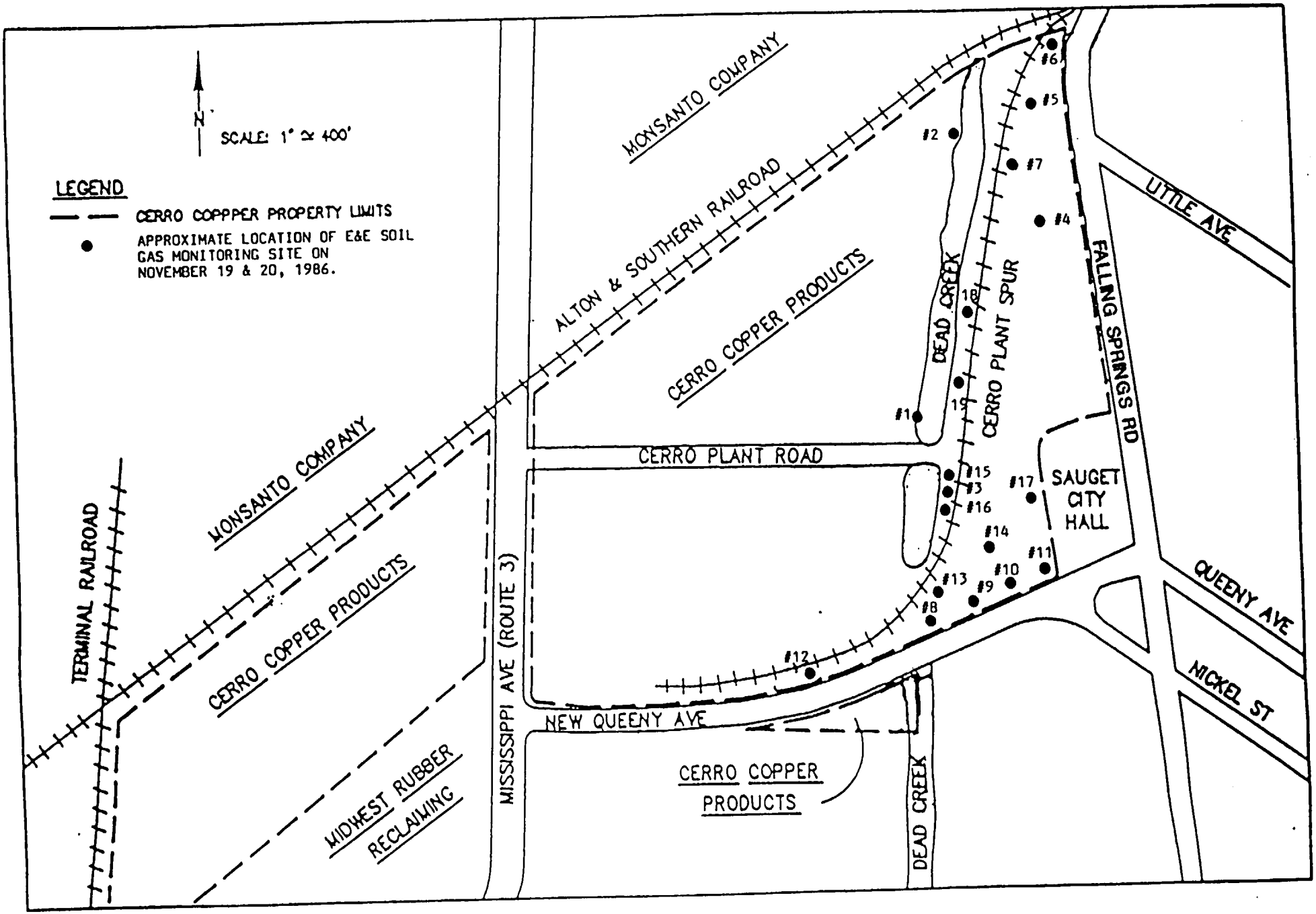

FIGURE 3

SOIL GAS MONITORING LOCATIONS

as methane equivalents (methane being the calibration gas). Location #8 had a reading of over 100 ppm as methane and the remaining locations were less than 4 ppm as methane. Gas samples for laboratory analysis were collected at locations #15 and #18 by E&E. These samples were split with Cerro representatives but were not analyzed. The results of E&E's analysis are unknown and to date have not been made available to Cerro.

E&E conducted additional field work at the site during January and February of 1987. Fifteen borings were drilled, including one upgradient of the site, three west of Dead Creek (Site A) and three on the portion of Site G owned by Cerro Copper. Nine monitoring wells were installed during the boring activities. The locations of the wells and the borings are shown in Figure 4.

Soil samples obtained during the borings were split with Cerro Copper. Laboratory analyses of the split samples appear to indicate contamination in the southern portion of the site. Samples from borings I7 and I12 were relatively clean except for detectable levels of PCBs. E&E's screening procedures eliminated borings I4 and I8 for laboratory analysis. Split samples were therefore not made available to Cerro. Results of samples I1, I2, I5, I6, I9, I10, and I11 all indicate the presence of extensive contamination from chlorinated solvents, specifically chlorinated benzenes (190,000 ppm 1,2,4-trichlorobenzene at I2). Boring I1 also appears to contain elevated levels of mercury (.19 ppm) and inorganics including barium, cadmium, chromium, copper, lead and tin. Boring I3 also appeared to contain contamination but at reduced levels. Draft data from the IEPA on E&E samples also indicate the same level and extent of contamination. PCBs and several pesticides were also detected in several borings in both sets of data.

Only four of the groundwater samples obtained from wells on their property were analyzed by Cerro Copper. These four were from EE-11, EE-13, EE-15, and EE-20. The results indicate detectable levels of organic contamination in EE-15 and EE-11. Inorganic levels detected do not indicate definite contamination. Draft data from the IEPA on E&E's samples also indicate organic groundwater contamination in the wells installed along the former pit area. The majority of contaminants detected are chlorinated solvents.

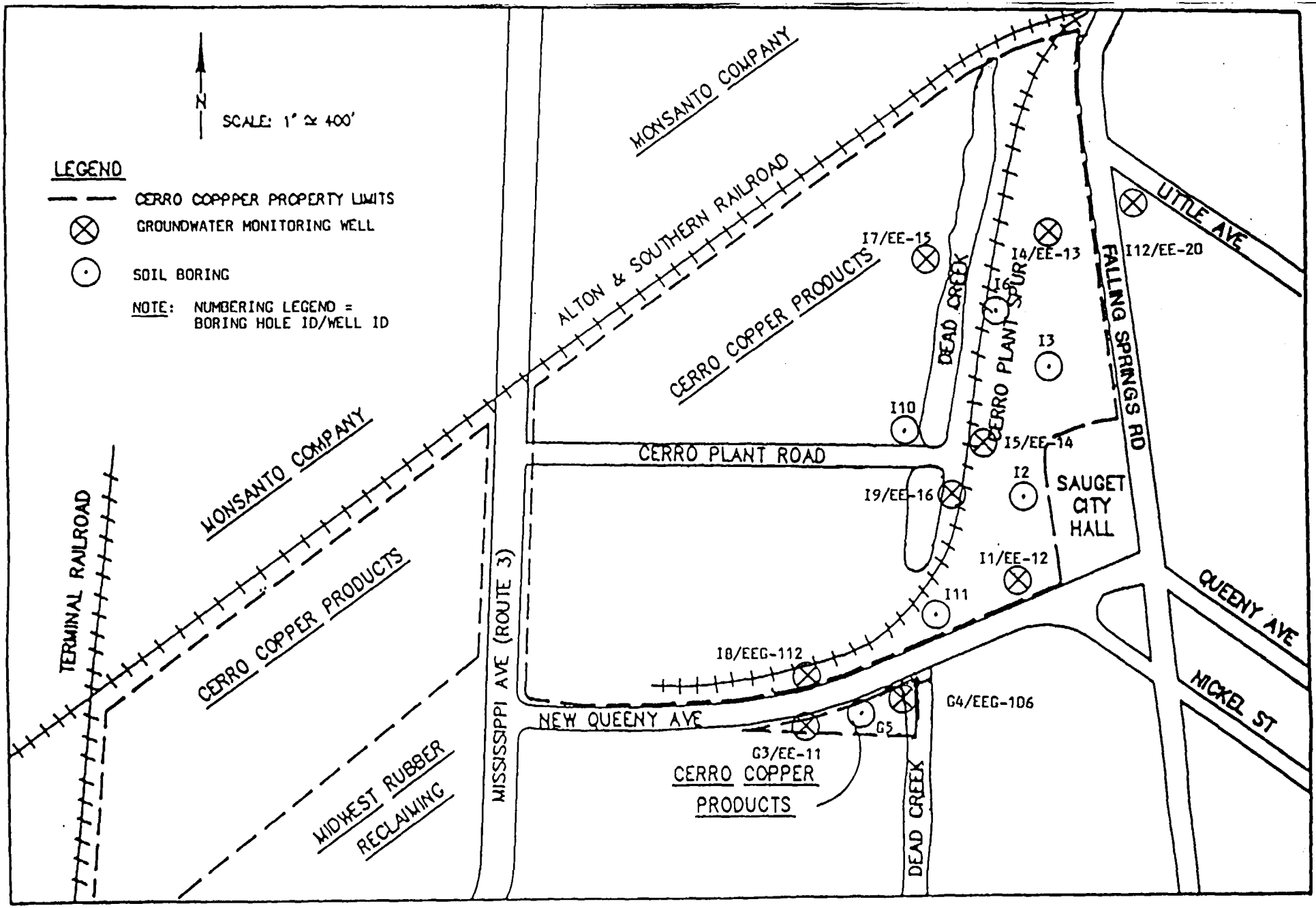

FIGURE 4

SOIL BORING LOCATIONS

SITE J

Site J consists of two pits and a surface disposal area located northeast of Cerro on property owned by Sterling Steel Foundry, Inc. One of the pits is believed to have been a borrow pit for construction fill and was later filled with scrap metal, demolition debris and casting sand. The second pit was excavated in approximately 1950 and is used to collect and settle baghouse dust from the foundry furnances. The surface disposal area has been used for the disposal of casting sand, slag, scrap steel and construction debris. There is no information available indicating the disposal of hazardous material. The area is currently being investigated by the IEPA because the pits and surrounding areas have been filled with "foreign" material.

Results of geophysical surveys conducted by E&E did not indicate the possible presence of buried drums. Significant interferences were encountered due to the presence of scrap steel.

Draft data of samples taken at the site indicate possible organic contamination in the subsurface. The major organic constituents being PAHs. Inorganic data and the actual sampling locations on the site are not currently available for review.

SITE K

Site K is the location of a former sand pit. The site is located north of a residential area on Queeny Avenue, and east of Falling Springs Road. Aerial photographs indicate excavation began at the site in the late 1940's and by 1955 was filled with unknown materials. E&E has determined that excavation also occurred in the early 1970s and a building was erected at the site sometime prior to 1973. The operations at the site during this time period are unknown. This second excavation was filled with unknown materials by 1979.

The area is currently being investigated by IEPA because the area has been filled with "foreign" material. No data is available to indicate the disposal of hazardous material. Draft results of samples taken by E&E indicate detectable levels of PAHs and PCBs in the subsurface. The actual sampling locations and inorganic data on the samples is currently unknown.

SITE L

Site L is the location of a former surface impoundment used by the Harold Waggoner Company to dispose of wash water generated from a truck cleaning operation. The Waggoner Company specialized in hauling industrial wastes for companies in the St. Louis/Metro East area. The impoundment was located approximately 250 feet south of the present Metro Construction Company building and approximately 125 feet east of Dead Creek. The impoundment is now covered with cinders and is used by Metro Construction for equipment storage.

Harold Waggoner operated the company from 1964 to 1974 and reportedly discharged wash water into Dead Creek until 1971. A pit was excavated to store the water in August of 1971 after the IEPA ordered Waggoner to stop discharging. In 1974, the operation was sold to Ruan Trucking Company which reportedly continued the wash water storage until 1978. The property is currently owned by Metro Construction Company.

Monitoring well G109, located approximately 100 feet west of the former impoundment, was installed by the IEPA in 1980. Initial sampling in 1980 indicated the presence of chlorophenol, phenolics, cyclohexanone and elevated levels of heavy metals. It is reported that during the installation of this well, the drillers became nauseous from fumes at the well location. The analysis of subsequent samples obtained in 1981 indicated the presence of phenolics and heavy metals. Prior to the E&E study, only one soil sample was obtained adjacent to the impoundment area, except those from Dead Creek. Metals and organics were not detected at elevated levels except for PCBs which were present at 80 ppm.

Geophysical studies were performed by E&E in December of 1985. Several abnormalities were detected but an accurate assessment could not be made due to surface interference. Although the actual sampling locations are currently unknown, draft results of subsurface samples indicate detectable levels of volatiles (such as benzene, toluene, and xylene), chlorinated benzenes, and PAHs. Pentachlorophenol was also detected at levels over 10 ppm. PCBs were not detected.

SITE M

Site M is a sand pit excavated by the H. H. Hall Construction Company in the mid to late 1940's. The pit is located immediatley east of Dead Creek and approximately 300 feet north of Judith Lane.

The only information available concerning waste disposal at Site M, have been the various complaints IEPA and the Cahokia Health Department have received about the pit and the adjacent creek in past years. In 1980, the IEPA sampled several private wells in the area and water seepage in a nearby basement. The results indicated an elevated level of copper, manganese, and phosphorus in one or more of the wells and in the seepage. Water and sediment samples obtained from the pit also contained elevated levels of heavy metals and PCBs. However, a hydrologic connection between the pit and the groundwater is inconclusive since the water level in the pit is approximately 2.0 feet higher than those found in nearby monitoring wells.

Draft results of sediment samples, taken by E&E from the pit, indicate detectable levels of PCBs (20 ppm). The only other organic parameters detected were phthalates which may not be indicative of contamination. Surface water analysis did not detect contamination. Inorganic results are not available for the sediment or water samples.

SITE N

Site N is the location of a former sand pit. The site is bordered on the north by residential property along Judith Lane; on the west by Dead Creek; on the south by residential property along Edwards Street; and on the east by Falling Springs Road.

Excavation is believed to have begun in the late 1940's as a borrow pit. The pit is currently filled in and is being used as part of an operations and equipment storage facility for the H. H. Hall Construction Company.

No known disposal of hazardous material has occurred at the site and no previous sampling data exists. E&E is to collect several surface and subsurface soil samples, soil gas and ambient air samples during their study. Results of most of this investigation have not been made available. Draft results of subsurface samples did not indicate any subsurface organic contamination.

SITE O

Site O, located on Mobile Avenue, is the Sauget Wastewater Treatment Plant and related property. The site consists of four inactive sludge dewatering lagoons, a waste pit and a separate area of contamination at the northwest corner of the property. The plant treats effluent from area industries including Monsanto, Cerro Copper, Sterling Steel Foundry, Amax Zinc, Rogers Cartage, Edwin Cooper and Midwest Rubber. The facility also received domestic waste from area residents prior to the completion of the new American Bottoms Regional Treatment Plant.

The lagoons were used for disposal of clarifier sludge from 1965 to approximately 1978. They are presently filled in and have been vegetated.

In May 1984, black tar-like material was uncovered south of the lagoons during a trench excavation. Samples of the material were collected and analyzed. The material, believed to be sludge from the lagoons, contained PCBs, phenol and a high percentage of oil and grease. Other priority pollutants were not analyzed.

In 1983, another contaminated area was identified by IEPA directly west of the treatment plant. Surface and subsurface soil samples were collected during two stages and were analyzed for PCBs and/or TCDD. The results indicate significant PCB (149,600 ppb) and TCDD (170 ppb) contamination throughout the area. The contaminated soil has since been excavated and is stored on-site. The piles are within a fenced area and have been covered with gravel. The final disposition is unknown.

Geraghty & Miller, Inc. on behalf of the SSDRA conducted a groundwater study of the property. Although the report concludes that contamination is present, it stated offsite impacts are minimal and remediation is not warranted and/or feasible. A clay cap and a partially penetrating slurry wall was recommended to prevent lateral migration of the waste from the lagoons and the pit. Comments from USEPA and IEPA were very critical of the report, concluding that the assessment needs to be expanded. Additional monitoring was recommended to identify the extent and sources of contamination. Containment of the

waste was also not in common agreement as an appropriate remedy, since the site conditions are not fully identified and containment methods have been known to fail over time.

The actual sampling locations are not currently known; however, draft results of subsurface samples obtained by E&E at Site O indicate various organic contamination. Elevated levels of volatiles (such as benzene, ethylbenzene, toluene and xylene), PAHs, chlorobenzenes and PCBs were detected. Inorganic data is currently not available.

SITE P

Site P is an inactive, IEPA-permitted landfill. The site is bordered on the west by the Illinois Central Gulf Railroad; on the south by Monsanto Avenue and on the east by the Terminal Railroad Association Railroad. The two railroads converge to delineate the north boundary.

The site was operated by Sauget and Company during the early 1970's through the early 1980's. Facility operating records reviewed during E&E's study found several entries of chemical disposal by Monsanto Company. Material identified included phosphorus pentasulfide and ACL filter residues. Some of the material is recorded as being removed, however, the composition of all the material landfilled is unknown. Diatomaceous earth filter cake from Edwin Cooper, Inc. (now Ethyl Corp.) was also landfilled in compliance with a supplemental IEPA permit. Analytical data indicates that this material contains elevated levels of lead,cadmium and zinc.

E&E was to conduct a groundwater and subsurface soil characterization study of the landfill. Draft results of subsurface soil samples indicate detectable levels of volatiles and chlorinated benzenes. A complete set of results of their work was not available at this time.

SITE Q

Site Q is the Sauget/Sauget Landfill, an inactive waste disposal facility operated by Sauget and Company between 1966 and 1973. The site is located on the east bank of the Mississippi River, on the river side of the flood control levee.

Documents relating to the site operation indicate chemical wastes were disposed in the landfill. In 1980, drums of unknown wastes were uncovered during excavation of a railroad spur.

USEPA had its FIT contractor conduct a study in 1983. A geophysical investigation determined the probable extent of landfilling and indicated areas of possible drum burial. Soil samples were taken during a drilling program and analysis detected high levels of contamination including 2,4-dichlorophenol, 1,2,4-trichlorobenzene, 1,4-dichlorobenzene, toluene, and PCBs. Two samples also had detectable levels of 2,3,7,8-TCDD (Dioxin).

Complete results from the additional work conducted by E&E are unknown. Draft results of groundwater samples indicate very high levels of organics. Volatiles, phenol (190,000 ppb), pentachlorophenol (35,000 ppb) and naphthalene (15,000 ppb) were all detected. Inorganic results are not available.

Site R

Site R is known as the Sauget Toxic Dump and/or the Krummrich Landfill. The area is an inactive industrial waste landfill used by Monsanto adjacent to the Mississippi River and is presently covered with a clay cap and is vegetated.

Both the Monsanto, W. G. Krummrich Plant in Sauget and the J. F. Queeny Plant in St. Louis filed Notification of Hazardous Waste Site Forms for the landfill. Community interviews conducted by the IEPA also indicated other area industries, including Cerro Copper, dumped material at the landfill. Currently there is no evidence to substantiate this or to indicate the type or volume of material.

Reportedly, the site contained liquid waste pits as well as the disposal of drums. Previous sampling has indicated elevated levels of chlorinated organics, including PCBs, and various inorganics in the subsurface water and soils.

Geraghty & Miller, Inc. on behalf of Monsanto conducted a groundwater study of Monsanto property. The study included the Krummrich Plant and the landfill. The report concludes that contamination is present, however, off-site impacts are minimal and remediation

is not warranted and/or feasible. Comments from USEPA and IEPA were very critical of the report, concluding that the assessment needs to be expanded. Downgradient and deep aquifer conditions are not adequately described and sources are not sufficiently identified.

Complete results from additional work conducted by E&E on Monsanto property is unknown. Draft results of groundwater samples indicate very high levels of organics. Volatiles, phenols (60,000 ppb), and chlorophenols (over 20,000 ppb) were all detected at elevated levels. Inorganic results are not available.

MISCELLANEOUS AREAS

Although they are not being investigated under the RI/FS, other areas of contamination are present in close proximity to Cerro Copper and may be effecting results of monitoring efforts.

Monsanto Company has conducted a fairly extensive study of subsurface conditions at the Krummrich Plant. The study, conducted by Geraghty & Miller, indicated that groundwater contamination is present at the plant in the shallow and intermediate zone of the aquifer and is moving to the south and the west. The figures in the report arbitrarily indicate that contamination ends at the Monsanto-Cerro Copper property line. This would appear unrealistic since monitoring has not been conducted off of Monsanto property.

USEPA and IEPA comments on the Monsanto report were critical of the conclusions and recommendations developed. The major comment was that the groundwater assessment needed expanding. Downgradient and deep aquifer conditions are not adequately described and both onsite and off-site sources of contamination were not sufficiently identified. The status of additional work or actions by Monsanto or IEPA are currently unknown. A full assessment of the contamination coming from Monsanto's property needs to be completed to effectively evaluate the data generated during the IEPA RI/FS.

Another source of contamination in the Sauget area is a Monsanto "drum disposal site" west of Route 3 and north of the former Darling Company property (now owned by Cerro Copper). Approximately 5,000 drums of nitrochlorobenzene were discovered at the site in 1985.

In January of 1986 a removal operation was halted in the early stages when excavation revealed that many of the drums were corroded and the contents had leaked into the surrounding soils and groundwater.

Geraghty & Miller conducted a study of the drum site for Monsanto and proposed a clay cap as a remedial measure. USEPA and IEPA were again very critical of the report and recommended an expanded assessment in the form of a unique RI/FS for the site. The concept of the clay cap was rejected based on the information available that the groundwater level moves up into the drum site and contamination has already moved away from the site. The clay cap will not stop the migration of the contaminants. Despite the agencies' dissatisfaction with the action, it is believed, based on IEPA correspondence, that the site has been capped. Additional work performed by Monsanto or its consultant on the assessment is unknown.

The contamination from the drum site will probably not effect the E&E study on Cerro's property; however, it is realistic to assume that the groundwater under the Darling property is affected by the drum site. Through their studies Monsanto has also generated a great deal of hydrogeologic data that could be utilized in assessing the Dead Creek sites.

IV SUMMARY OF INFORMATION SEARCH

A review of the available data on the IEPA Sauget/Dead Creek Project, indicates that the three sites owned or partially owned by Cerro Copper Products Company are apparently contaminated with organic and inorganic pollutants. Studies conducted by the IEPA contractor (E&E) indicate the southeast portion of Cerro's property has been used for the disposal of chemical waste. Site I (east of Dead Creek) and Site G (triangular section south of Queeny Avenue) both appear to have been used for the burial of waste, including the possibility of drummed material.

Although it is circumstantial, the organic materials found are many of the same compounds Monsanto has indicated they have produced and have buring in other landfills/dumps in the area. This is especially true of the chlorophenols and dichlorobenzenes that were found in the majority of samples. Other area industries may also share in the responsibility since it seems that the sites were operated as common disposal areas for the region.

In organic contamination has been detected in the creek sediments and the groundwater. Because copper is among the elevated elements, Cerro will probably be viewed as the major source of this contamination. Reports of community interviews condicted by the IEPA have also indicated that local citizenry have indicated Cerro Copper, along with other local industries, utilized the disposal areas in Suaget. Cerro Copper is also reported to have disposed of materials in the Monsanto landfill (Site R). The type and volume of material supposedly disposed is not reported. The fact that their name has been linked with the varous sites increases the likelihood that Cerro might be included as a Potentially Responsible Part (PRP) for the cleanup.

The users of the Sauget Treatment Plant will also probably be looked to for financial assistance in the remediation of the sludge drying lagoons. Since Cerro Copper has discharged material to the plant, they will probably be included. In organic data on the sludge is not currently available to assess the extent of Cerro's possible involvement.

Because of the close proximity of the numerous sites and the apparent large scale groundwater contamination, the full impact from each site is not expected to be determined. It is possible that individual sources of contamination will be removed and regional groundwater remediation, if feasible, will be undertaken. Site specific groundwater remediation will not be possible and Cerro's future involvement will need to be in conjunction with the other industries in the area. The percentage of involvement by Cerro is a major issue that still needs to be addressed for both the removal of waste and contaminated soil and the remediation of groundwater.

V REFERENCES

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3. Bruin, J. and Smith, H. F.; Preliminary Investigation of Groundwater Resources in the American Bottom in Madison and St. Clair Counties, Illinois; Illinois State Water Survey Division; 1953.

4. Ecology and Environment, Inc.; Description of Current Situtation at the Dead Creek Project Sites; 1986.

5. Emmons, J. T.; Groundwater Levels and Pumpage in the East St. Louis Area, Illinois, 1972-1977; Illinois State Water Survey, Urbana; 1979.

6. Illinois Environmental Protection Agency Project Files; October 1987.

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9. Schicht, R. J.; "Electric Analog Model Study of a Sand and Gravel Aquifer;" Transactions of the ASAE, Vol. 7, No. 3; 1964.

10. Schict, R. J.; Ground-Water Development in East St. Louis Area, Illinois; Illinois State Water Survey, Urbana; 1965.

11. St. John, R.; A Preliminary Hydrogeologic Investigation in the Northern Portion of Dead Creek and Vicinity; Illinois Environmental Protection Agency; 1981.

APPENDIX I

SITE PLAN OF IEPA STUDY

APPENDIX II

AERIAL PHOTOGRAPHS

USDA - ASCS

(Not included with draft report)

Sverdrup
CORPORATION

801 North Eleventh
St. Louis, Missouri 63101

314 436-7600

MEMORANDUM

DATE: August 31, 1987

TO: Mr. S. A. Silverstein - Cerro Copper Products

FROM: Steven M. Hornung

SUBJECT: Background Information Search Update

The information, obtained by Cerro Copper and its legal counsel, from the Illinois Environmental Protection Agency (IEPA) has been fully reviewed. Unfortunately, portions of the information in the form of drawings and tables were not included in the packages received from IEPA. The majority of the information obtained is recent findings from the study being performed by Ecology and Environment, Inc. and not historical records indicating how the concerns for the area developed. The IEPA "St. John Report" has also been reviewed, however, much of the information that was utilized for the report has not been made available.

In an effort to fill these data gaps, Sverdrup is currently working with IEPA to review their files on the subject study. It is anticipated that this review will occur within the next two weeks.

Since the IEPA study is not limited to Cerro Copper property, the scope of the original background search has been expanded to cover the other sites being investigated. There are currently eighteen (18) sites including six (6) portions of Dead Creek being studied. Background information of the past uses of these sites, possible responsible parties and results of the current investigation will be reported. A map of Sauget showing the areas of investigation is being developed and will be completed when the boundaries of the sites are better defined from our background search.

A title search of property currently owned by Cerro Copper has also been conducted. This search also investigated transfers of the property prior to the sale to Cerro Copper Products.

The background investigation is proceeding, however, as you are aware progress has been slow. As previously indicated, the transfer of information with IEPA has not been effective. It is anticipated that a draft report will be developed for your review by mid-October.

Should you have any questions please feel free to call.

BACKGROUND INFORMATION SEARCH
SAUGET PLANT SITE

submitted to

CERRO COPPER PRODUCTS COMPANY

SAUGET, ILLINOIS

January 19, 1987

Sverdrup
CORPORATION

801 North Eleventh
St. Louis, Missouri 63101

314 436-7600

January 19, 1987

Cerro Copper Products Company
P.O. Box 681
East St. Louis, Illinois 62202

Attention: Mr. Sandy A. Silverstein
Manager, Energy and Environmental Affairs

Gentlemen:

Subject: Proposal for Background Information Search
Sauget Plant Site

Sverdrup is pleased to submit this proposal for a background information search for the property previously and currently owned by Cerro Copper Products Company in Sauget, Illinois. We are experienced in all aspects of the work required and are prepared to assign our most capable personnel, as defined in Section III of our proposal.

The work proposed is considered a necessary prerequisite to any work related to a full-scale remedial investigation (RI) of the Cerro Sauget Plant property.

The costs presented in Section V represent our estimate of the compensation required for the work. As with our previous contracts with Cerro, we propose to provide our services on a cost-reimbursable basis as described in the standard contract provisions included in Section V.

We are most interested in assisting Cerro in the remedial investigation of the Cerro Sauget Plant site, and we look forward to working with you on all phases of the work. Please contact me should you need additional information during your evaluation.

Sincerely yours,

SVERDRUP CORPORATION

Jules B. Cohen
Vice President

cc: Paul Tandler, Cerro Copper Products

TABLE OF CONTENTS

SECTION

I. BACKGROUND

In October 1986, Sverdrup submitted a proposal to Cerro Copper for a preliminary hydrogeologic investigation of the Sauget Plant site. The work defined in the proposal was considered a preliminary phase (Phase I) of a full-scale remedial investigation (RI) of the Cerro Sauget Plant property.

In December 1986, Sverdrup submitted a second proposal to Cerro Copper for a full-scale remedial investigation of the Sauget Plant site. The work defined in the proposal was identified as Phases II and III of the RI.

On January 13, 1987, Ed Preissner and Larry Oliver of Sverdrup met with Sandy Silverstein of Cerro Copper to discuss the overall Sauget Area RI/FS and to query Sandy about Cerro's intentions regarding the Sverdup proposals and the work in question. Sandy Silverstein indicated that Cerro is reviewing their position and will take action after information from the IEPA RI/FS becomes available. Sverdrup expressed concern that Cerro may not be acting on the project, and recommended that Cerro at least begin to compile the background information identified in the Sverdup proposals. Sverdrup noted that they believe the information will provide the basis for decision making regarding Cerro's commencement of the investigation and regarding the relationship between Cerro and Monsanto.

Based on the meeting, it was established that Sverdrup should submit a cost proposal for conducting the background information search defined in the previous proposals.

II. TECHNICAL APPROACH

Sverdrup's technical approach for the Cerro Sauget Plant Site Background Information Search involves the following general areas of activity:

1. Reviewing all available information in the possession of Cerro Copper Products Company regarding land ownership, land acquisition, land use, and subsurface water quality for the property previously and currently owned by Cerro.

2. Reviewing local, state, and federal government files for land ownership, land use, and subsurface water quality information for the general study area and for information from any previous studies related to the purpose of background information search; including geologic, hydrologic, and other investigations of the vicinity.

3. Interviewing available persons that may be knowledgeable about the activities taking place on the property previously and currently owned by Cerro.

4. Compiling all information obtained into a logical and useful format to serve as a background document for the Cerro Sauget Plant Site.

The information search will focus primarily on Cerro property. However, any relevant information and documents dealing with property adjoining Cerro property, and discovered during the search, will also be collected and included in the background document.

III. PERSONNEL

The information search will be conducted by Sverdrup's Environmental Division under the direction of Dr. Jules Cohen. It will be under the direct technical control of Mr. Edgar Preissner, Sverdrup's environmental principal for hazardous waste management. He will direct our project manager on all technical aspects of the work.

Mr. Larry Oliver will serve as our Project Manager. He will work directly with Cerro personnel on all aspects of the work. Mr. Steve Hornung, Mr. Murray Meierhoff, and/or Mrs. Marjorie Melton (or personnel of equivalent experience) of Sverdrup's Environmental Division will assist Mr. Oliver in the conduct of the work.

The qualifications and experience of the personnel identified are included in the form of resumes for your review.

JULES B. COHEN

VICE PRESIDENT, ENVIRONMENTAL DIVISION

Joined Sverdrup in 1979 as Director of the Environmental Laboratory. Became division manager in 1985. Responsible for activities of Sverdrup's Environmental Division.

Professional History

Dr. Cohen was previously Vice President and Director of the Sverdrup Environmental Laboratory at Sverdrup Technology, Inc., Tullahoma, Tennessee. Responsible for laboratory analytical services and environmental engineering studies. Prior to this, he was Deputy Assistant Director for Technical Support, EPA, National Enforcement Investigations Center (NEIC), Denver, Colorado, where he directed laboratory analytical services for all environmental media, the remote-sensing program, and computer technical information services. As Technical Coordinator, EPA NEIC in Denver, Dr. Cohen assisted in coordinating the planning and conduct of studies assessing the impact of industrial and municipal wastewater, air, water, toxic substances, and radiological pollutants on the environment. While Chief, Environmental Sciences Branch, Arctic Health Research Center, Fairbanks, Alaska, Dr. Cohen directed staff conducting research, demonstration projects, and technical assistance toward the solution of environmental health engineering problems of high latitudes and low temperatures. He also taught graduate engineering at the University of Alaska.

Earlier, Dr. Cohen was a Senior Sanitary Engineer with the U.S. Public Health Service at the R. A. Taft Sanitary Engineering Center, directing research and field surveys of water pollution and applying digital computer techniques to stream sanitation and water pollution control.

Recent experience includes consulting services for the Resource Conservation and Recovery Act (RCRA), an environmental audit of NASA's Goddard Space Flight Center, investigations for radioactivity at a school facility in Missouri, and expert witness on water quality chemistry.

Professional Background

Registered Professional Engineer in Tennessee and Colorado
Diplomate, American Academy of Environmental Engineers (AAEE)
Ph.D., Environmental Health Engineering - California Institute of Technology, Pasadena, California, 1965
M.S., Civil Engineering - University of Colorado, Boulder, Colorado, 1958
B.C.E., Civil Engineering, City College of New York, New York, NY, 1955
EPA Bronze Medal for Commendable Service, 1978
Patent, EPA Stage II Vapor Recovery Test Procedure, 1978
USPHS Commissioned Officer Award, 1979
Entered the profession in 1955; joined Sverdrup in 1979

Other Activities

Member, AAEE Adhoc Committee on Hazardous/Toxic Waste Management
Member, EPA Environmental Engineering Peer Review Panel
Former member, Tennessee Air Pollution Control Board
Served as a consultant to the EPA Science Advisory Board and to the Tennessee Department of Public Health
Former member, Surface Water Quality Committee, International Poplar River Water Quality Board of the International Joint Commission

EDGAR D. PREISSNER

Environmental Principal, Hazardous Waste Management

Specialized Professional Competence

Hazardous waste engineering
Project management
Regulatory guidelines
Wastewater treatment

Representative Project Experience for Others

Management, including profit and loss responsibility, of waste landfill operation consisting of 65 disposal sites nationwide, with gross annual revenues of $65 million. Managed field operations through eight regional managers. Upgraded equipment program and directed development of personnel training, maintenance, and operations manuals. Managed CERCLA and RCRA compliance programs, filing of Part As and Bs, review and development of new landfill designs and plans for operations and closures, and development of remedial designs and corrective construction

Managed design, engineering, operation, and construction of 100-acre waste landfill. Total height of fill was 180 feet, with portion of excavation beneath groundwater table

Developed program management systems for federal study of industrial and hazardous waste impacts on Great Lakes. Established project goals and schedules and developed preliminary data base. Formulated computer model to forecast waste dispersion and impacts

Wrote and implemented engineering study program for assessing industrial and hazardous waste discharges, impact on environment, and judicial source documentation

Evaluated management techniques, and the application of integrated logistic support (ILS) for major projects such as the U.S. Department of Energy's $6 billion Strategic Petroleum Reserve

Managed engineering group for industrial waste site engineering studies and remediation programs. Developed air dispersion computer modeling for waste discharges

In charge of operation and engineering group, with profit and loss responsibility. Directed the design, engineering, and construction of waste processing plants. Implemented effective project planning and management. Implemented projects in Algeria, Brazil, Greece, and Belgium

Professional Background

Registered Professional Engineer in Illinois
MBA in Finance, University of Chicago, 1973
MS in Civil Engineering, University of Wisconsin, 1964
BS in Civil Engineering, Northwestern University, 1961
Entered the profession in 1961; joined Sverdrup in 1986
Member - National Society of Professional Engineers
- American Society of Civil Engineers
- Water Pollution Control Federation

LARRY J. OLIVER

Project Engineer, Environmental Division

Specialized Professional Competence

Municipal and industrial wastewater treatment
Environmental studies and preparation of regulatory documents
Sewer system design
Project management
Plant start-up

Representative Project Assignments

Project engineer for:
- Preliminary and final design of 28-mgd Missouri River Wastewater Treatment Plant for Metropolitan St. Louis Sewer District (MSD), MO
- Design of 6.8-mile Creve Coeur Creek interceptor sewer for St. Louis MSD
- Design of 1.5-mgd industrial wastewater pretreatment facility, 3,000 gpm pumping station, and 12-inch force main for Monsanto Chesterfield Village Research Center
- Design of 2.5-mgd wastewater treatment plant for St. Louis MSD, Caulks Creek watershed, St. Louis County, MO
- Effluent guidelines, new source performance standards, and pretreatment standards studies of textile mills industry for U.S. Environmental Protection Agency (EPA)
- Hazardous waste studies to assess impact of regulations under Resource Conservation and Recovery Act on textile mills industry for U.S. EPA
- Operations investigation and evaluation of design change alternatives for the sewage treatment system at Union Electric Co's Callaway County (MO) nuclear power plant

Design responsibility during construction and start-up phases of the sewage treatment and potable water systems at Union Electric Co's Callaway County (MO) nuclear power plant

Start-up assistance for:
- 70-mgd Eugene-Springfield municipal secondary wastewater treatment facility in Eugene, OR
- 6-mgd Miller Brewing Company industrial water treatment facility in Trenton, OH

Preparation of operations manual supplement and industrial pretreatment program for expansion to City of Perryville, MO wastewater treatment plant

Operations assistance for 80,000 gpd packaged treatment facility located at Union Electric Company nuclear power plant, Callaway County, MO

Representative Project Assignments for Others

Commissioned Officer, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, 1970-1974

Professional Background

Registered Professional Engineer in Missouri
MS in Engineering Management - University of Missouri, 1983
MS and BS in Civil Engineering - University of Missouri, 1976 and 1970
Entered the profession in 1970; joined Sverdrup in 1976
Technical publication, Journal of the Water Pollution Control Federation, 1980
Member - American Society of Civil Engineers
- National Society of Professional Engineers
- Water Pollution Control Federation
- Engineer's Club of St. Louis

STEVEN M. HORNUNG

Environmental Engineer

Specialized Professional Competence

Water and wastewater treatment
Activated alumina adsorption
Hazardous waste regulations
Water, wastewater, and hazardous waste sampling

Representative Project Assignments

Project manager for contamination assessment and remedial action feasibility study at railroad fueling facility, Dupo, IL
Design engineer on potable water treatment and distribution system at Anheuser-Busch land application site, Jacksonville, FL
Project engineer for hazardous waste audits at industrial plants, St. Louis, MO
Engineer for design of 28-mgd Missouri River secondary treatment plant, Metropolitan St. Louis Sewer District (MSD), St. Louis, MO

Representative Project Assignments for Others

Engineer performing preliminary assessments and site inspections at potential hazardous waste sites, Mississippi and Alabama
Prepared site safety and sampling plans for hazardous waste inspections, Mississippi and Alabama
Project engineer for design of recycling system for process water at veneer manufacturer, Waynesboro, MS

Professional Background

Engineer-in-Training in Missouri
MS and BS in Civil Engineering - University of Missouri-Columbia, 1984 and 1982
Technical presentation on removing selenium from drinking water by adsorption using activated alumina at the AWWA Convention, 1983
Entered the profession in 1984; joined Sverdrup in 1985
Member - American Society of Civil Engineers
- American Water Works Association
- Water Pollution Control Federation
- Hazardous Materials Control Research Institute

MURRAY L. MEIERHOFF

Environmental Scientist

Specialized Professional Competence

Hazardous waste impact assessment, including coverage under RCRA and CERCLA
Water quality surveys and assessment
Water quality standards review
NPDES discharge permit limitations compliance studies
Field sampling

Representative Project Assignments

Remedial investigations and feasibility studies for Missouri Pacific Railroad in Dupo, IL for hydrocarbon contamination in soils and groundwater. Other contaminants include PCB's, phenols, and cyanides
Performed site investigation of suspected hazardous waste dump in western Tennessee to establish the presence and extent of buried drums and associated groundwater contamination
Conducted an assessment of an industrial wastewater treatment system in Mississippi to determine whether the system was subject to RCRA regulations, and whether a waiver provision could be obtained
Maintained an update file on all amendments and changes to RCRA and CERCLA

Representative Project Assignments for Others

Review and revision of State of Iowa's water quality standards as a member of the Iowa Water Quality Review Subcommittee
Participant in the State of Iowa's Section 208 non-point source runoff surveys of small- and medium-size watershed basins in rural Iowa
Field sampling to determine NPDES discharge permit compliance of numerous industrial and municipal wastewater treatment facilities in Iowa
Collection, identification, and data interpretation of water, fish, and benthic macroinvertebrate samples to assess possible impacts from hazardous waste site leachate on the Cedar River, Charles City, IA

Professional Background

MA in Aquatic Biology and BA in Zoology - University of Missouri-Columbia, 1977 and 1974
Entered the profession in 1977; joined Sverdrup in 1981
Numerous professional publications
Hazardous Materials Handling Course reflecting requirements of EPA 1440.2- Health and Safety Requirements for Employees Engaged in Field Activities, and 1440.3 - Respiratory Protection, and EPA's Standard Operating Guides
Member - North American Benthological Society
Past Member - Iowa Water Quality Standards Revision Subcommittee (1980) of the Iowa Water Quality Commission

MARJORIE L. MELTON

Environmental Engineer

Specialized Professional Competence

Hazardous waste permitting assistance
Chemical engineering

Representative Project Assignments for Others

As Public Health Engineer for Bureau of Hazardous Waste Management, Richmond, Virginia, assigned as a chemical engineer to provide technical support to the regulatory board of the Department of Waste Management, governing the management of hazardous waste. Responsible for reviewing permit applications and writing permits in compliance with state and federal hazardous waste management regulations and sound engineering practices; giving consultation on the technical aspects of hazardous waste management; conducting inspections and investigations of hazardous waste management practices; carrying out enforcement actions by developing an evidentual base; and participating in hazardous incident emergency responses

As Process Engineer, Allied Corporation, Hopewell, Virginia, responsibilities included providing justification and process design information for all equipment replacement such as distillation columns, heat exchangers, liquid solid separators and pumps; completing detailed material balance on the unit's bleed system; implementing process changes that resulted in cost savings; conducting studies to decrease nitric acid losses; providing process information for possible sale of waste gas; and completing steam balances for the entire Hopewell plant

As Manufacturing Technology Engineer for Monsanto Chemical Company, Cincinnati, Ohio, assigned as technical support to Manufacturing for the protection of ABS polymer through emulsion polymerization

Professional Background

BS, Chemical Engineering, University of Missouri, Rolla, 1979
Inspectors Training Course, Northwest Hazardous Waste Project
Hazard Evaluation and Environmental Assessment, Environmental Protection Agency
Incineration of Hazardous Waste, Louisiana State University
Hazardous Materials Emergencies, Virginia Department of Emergency Services
Environmental Protection Continuing Education, Johns Hopkins University
Entered the profession in 1979; joined Sverdrup in 1986

IV. SCHEDULE

Our work sequence and estimated schedule to perform the work outlined in our proposal are illustrated below by listing the total calendar days required from your notice to proceed for the sequence of activities. The activities represent specific milestones of the investigation.

Activity	Calendar Day
Notice to Proceed	0
Complete Information Search	30
Compile Background Document	60

V. COSTS AND FEE BASIS

The following tabulation provides our estimate of the manhour requirements to perform the proposed work.

	MANHOURS		
Activity	Management	Engineering	Clerical
Information Search	8	104	8
Compile Background Document	8	60	16
TOTALS	16	164	24

The following tabulation provides our estimate of the direct cost requirements to perform the proposed work.

Direct Cost Area	Dollars
Principals Time	100
Telephone	100
Transportation	300
Word Processing	200
Reproductions	200
Miscellaneous	200
TOTAL DIRECT COSTS	$1,100

The following tabulation provides a summary of the estimated costs and fee basis for the proposed work.

Item	Dollars
Salaries	2,960
Salary Related Expenses	1,140
Overhead & Profit (2.15 Factor)	4,700
Direct Costs	1,100
TOTAL FEE	$9,900

SVERDRUP CORPORATION
STANDARD CONTRACT PROVISIONS
TERMS OF PAYMENT—COST REIMBURSABLE BASIS

A. SALARY COSTS, OVERHEAD & PROFIT

As compensation for our services, we will be reimbursed for the salary costs of our professional, technical and supporting personnel for the time during which they are directly employed in work covered by this agreement, multiplied by a factor of 2.15 to cover overhead and profit.

1. Salary costs are defined as the salaries paid for regular time and overtime (including any premium overtime) worked, plus provision for applicable annual salary related expenses, including sick leave, vacation pay, holiday pay and other ordinary and customary paid time off, bonuses, the employer's portion of social security, unemployment and other payroll taxes, Employee's Retirement and Benefit Plan contributions, employer's portion of group hospitalization and medical insurance, and the cost of worker's compensation insurance.

2. Included in overhead are:
   (a) The salaries of officers, except for technical or advisory services directly applicable to the project.
   (b) The salaries of employees doing general administrative work; also nonproductive professional and technical salaries, including maintenance of staff to provide readiness to serve.
   (c) Rent and costs of light, heat and water; equipment depreciation and maintenance cost; costs of office supplies and reproduction of data for our internal use; general communications expense, including local telephone calls and postage; taxes; insurance premiums and license fees; automotive expense and other transportation and travel expense not chargeable to specific contracts; and other miscellaneous costs.

B. OTHER REIMBURSABLE COSTS

In addition, we will be reimbursed for the following:

1. Travel, subsistence, and incidental expenses of personnel while traveling in connection with the work. The costs of a change of employee's residence are reimbursable if required by the work.

2. Transportation by passenger automobiles that we supply intermittently in connection with the work, at the rate of 21 cents per mile. All costs of owned, leased or rented passenger vehicles assigned to the work and car allowances granted to management and supervisory personnel are reimbursable. Reimbursement for the cost of special types of vehicles will be at rates to be mutually agreed upon when such vehicles are required.

3. Reproduction of drawings, photographs, maps, charts and reports which are prepared for the Client's periodic or interim review and also the cost of the reproductions which constitute the delivery of work.

4. Wire and wireless communication of messages and data in connection with the work.

5. Insurance required by the Client in addition to the coverages or in excess of the limits normally carried.

6. Subcontracted services such as, but not limited to, borings, surveys, photogrammetry, testing and computing services, if required in the performance of the work, plus an amount equal to 10% thereof to cover cost of handling.

7. Technical support services provided from our own facilities, as required in the performance of the work.

8. Special consultants, as approved by the Client, if required in the performance of the work, plus an amount equal to 10% thereof to cover the cost of handling.

9. Technical and advisory services of officers directly applicable to the project at the hourly rate of $100.

C. TERMS OF PAYMENT

Invoices for actual work performed and cost incurred will be submitted at four-week intervals with payment due upon presentation. Interest of 1% per month (or any lesser legal limit applicable) will be charged on invoice amounts outstanding more than 45 days from invoice date.

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The above provisions are predicated on the work being performed in our regularly established offices and may be subject to revision if separate offices are necessary for project purposes.